Electronic Version

Stylesheet Version v1.1.1

Description

[Insert title of invention]*Battery and inverter configuration with increased efficiency.*

BACKGROUND OF INVENTION

[0001] The invention relates to battery and inverter configuration and more specifically with increased efficiency.

[0002] *DESCRIPTION OF PRIOR ART*

[0003] In prior systems either one inverter is used or multiple inverters are used but are always activated so at low load the system is not very efficient. Even though multiple inverters are used only one battery string may be used and as more power is used the batteries operate more inefficient. Where only one inverter is used the system lacks redundancy and if the inverter or battery string fails the whole system fails. Some inverters may have a low standby power usage, but as soon as they are activated, their power consumption goes up and the efficiency at low

power usage is still low.

[0004] There is still room for improvement in the art.

Summary of Invention

[0005] In order to increase efficiency of battery powered AC electricity supply, the current invention has multiple inverter / battery modules that are used in parallel but can be individually shut down. The number of inverters activated depends on the power usage. When only a little power is needed only one or a few inverters are activated. When more power is needed the battery inefficiency increases and more inverters will be activated.

Brief Description of Drawings

[0006] Without restricting the full scope of this invention, the preferred form of this invention is illustrated in the following drawings:

[0007] FIG. 1 is a chart showing Inverter efficiency based on relative power usage;

[0008] FIG. 2 is a chart showing Battery power efficiency versus power usage;

[0009] FIG .3 displays the Inverter/battery modules in parallel and connected to a controller;

[0010] FIG. 4 is a graph displaying an example of the number of

inverters activated based on actual power usage;

[0011] FIG. 5 is a graph of residential power usage;

[0012] FIG. 6 is a graph of the number of inverters needed to service about consumption assuming 2 kW inverters and 1.5 kW thresholds;

[0013] FIG. 7 is a graph of an example of where only one inverted is needed in more than 95% of the time; and

[0014] FIG. 8 is a graph based on an example of using five 2 kW inverters instead of one 10 kW inverter.

DETAILED DESCRIPTION

[0015] The following description is demonstrative in nature and is not intended to limit the scope of the invention or its application of uses.

[0016] There are a number of significant design features and improvements incorporated within the invention.

[0017] To increase efficiency of battery powered AC electricity supply, the current invention 1 has multiple inverter / battery modules that are used in parallel but can be individually shut down. The number of inverters activated depends on the power usage. When only a little power is needed only one or a few inverters are activated. When more power is needed the battery inefficiency increases

and more inverters will be activated.

[0018] Figure 1 displays a chart showing how the Inverter efficiency based on the relative power usage. The chart shows that inverter efficiency goes up exponentially based on inverter relative output. While Figure 2 displays a chart that shows Battery power efficiency versus power usage. This chart shows how battery efficiency goes down based on battery load.

[0019] The invention consists of an inverter supplied with power from a string of batteries (DC energy sources) 5 where two or more of these are connected to a common load 20 and where two or more of these are also connected to a controller 10 through a communication bus 30 connected to the invertors 15. The DC energy sources 5 are connected to the invertors 15 are connected to the power grid 100 and load 20 through the line 105. The controller 10 can be a separate unit or the inverters 15 can have individual controls that form a peer-to-peer network and the control is divided between the units. This provides extra redundancy as in case one unit is lost the rest can provide the control function. Figure 3 displays the Inverter/battery modules in parallel and connected to a controller 10.

[0020] Figure 4 shows a graph displaying an example of the

number of inverters 15 activated based on actual power usage. It shown that more inverters 15 being needed for the higher power loads.

[0021] The controller 10 measures the power consumption of the load using a sensor. Based on the power consumption and a built-in algorithm and / or look-up table the controller determine which of the inverters to activate. Said built-in algorithm and/or look-up table is sourced on said controller 10 in a memory means which are well know in the art. Figure 5 displays a graph of residential power usage. While Figure 6 displays a graph of the number of inverters 15 needed to service power consumption in Figure 5 assuming 2 kW inverters and 1.5 kW thresholds.

[0022] In this invention, the inverters 15 do not need to be of the same power rating. A lower power inverter 15 could be used to run the loads during extended low power periods. In case the inverters are used for peak shaving, batteries connected to inverters 15 not in use can be recharged as long as the input power does not exceed the peak shaving threshold. A simple algorithm for equal sized inverters could be: $n_{inverters} = INT(P_{usage} / P_{threshold})$ number of inverters needed is the integer part of power usage divided by a threshold power depending on the inverters

used.

[0023] As shown in the bar chart in Figure 7, only one inverted is needed in more than 95% of the time based on normal power usage.

[0024] The electrochemical storage 5 feeding DC current to the individual inverter 15 can either be identical for all inverters 15. By using the same type of storage (batteries and/or capacitors and/or flywheels) 5 will create redundancy. This is so in case one string fails the others can provide energy but at a reduced level. The using different types of storage may allow for the use of high power / short duration energy storage for peak power and high energy storage devices for base power. In the preferred embodiment, suitable high power storage devices 5 includes but are not limited to: High power lead-acid, high power nickel metal hydride, nickel zinc, lithium-ion, lithium-metal, sodium chloride batteries, and symmetrical or asymmetrical supercapacitors (also called ultra capacitors), and mechanical flywheel technology. The suitable high energy storage devices 5 includes but are not limited to: Lead-acid, nickel metal hydride, sodium sulfur, nickel chloride, nickel zinc, lithium-ion, and lithium metal batteries.

[0025] Figure 8 displays a graph based on an example of using

five 2 kW inverters 15 instead of one 10 kW inverter. It shows that using 5 2 kW inverters instead of one 10 kW inverter 15 can potentially reduce the power loss with 50% or more.

[0026] Alternative Embodiments Yet another embodiment of the invention, the base power may also be supplied using power generating devices including but not limited to fuel-cells, solar-panels, gas turbines, sterling engines, and diesel generators.

[0027] Although the present invention has been described in considerable detail with reference to certain preferred versions thereof, other versions are possible. Therefore, the point and scope of the appended claims should not be limited to the description of the preferred versions contained herein.

[0028] As to a further discussion of the manner of usage and operation of the present invention, the same should be apparent from the above description. Accordingly, no further discussion relating to the manner of usage and operation will be provided.

[0029] With respect to the above description, it is to be realized that the optimum dimensional relationships for the parts of the invention, to include variations in size, materials,

shape, form, function and manner of operation, assembly and use, are deemed readily apparent and obvious to one skilled in the art, and all equivalent relationships to those illustrated in the drawings and described in the specification are intended to be encompassed by the present invention.

[0030] Therefore, the foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly, all suitable modifications and equivalents may be resorted to, falling within the scope of the invention.